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ON THE EXPLOSION OF AUTOMATION

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1. INTRODUCTION

There is a great deal of current justified concern about automation and its technological, economic, political and psychological impact upon a capitalistic and democratic society. Since the situation is without parallel in the history of the world, and since there are so few contemporary studies, it is difficult to form judgments. It is certainly tempting to take the counsel of those who feel that everything will work out all right with some temporary readjustments—on the parts of others—or of those who cite various econometric indices and extrapolate smoothly.

I feel that there are too many new forces loose which make extrapolation meaningless and which do not permit complacency. In view of the complexity and uncertainty always associated with politico-economic prediction, very little can be said in a definitive fashion. If, however, as is the case, the probability of serious and unpleasant consequence is high, then one is justified in taking preventive measures now.

Let me list some of these new forces and discuss them briefly.

2. IMPROVEMENTS IN COMPUTERS

As we will indicate below, automation can and will proceed without computers. Its effect, however, is intensified by the existence of large computers, and the

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continuing development of powerful devices of this nature will speed the process. It is meaningful therefore to consider what is happening in the computer field.

The best commercial computer readily and widely available is the result of only fifteen years of industrial research. In order to see where we are on the scale, it is perhaps useful to compare the development of the commercial airliner, from the Wright brothers' plane to the modern jetliner. The computer we are thinking of is about at the level of the DC-3. In other words, computers at least one generation ahead can be built at the moment; those another generation ahead are being designed; those two generations ahead are in the immediate offing, say ten-twenty years.

When we consider the effects of computers on automation, we must keep in mind what will be available in a few years as well as what is currently available. Without going into details, we wish to emphasize that many industrial and business procedures are not automated today only because of the lack of capacity or the slowness of current computers, or because mathematicians and engineers cannot use available computers as well as they should. Larger and faster computers will bypass both problems.

It is quite misleading to extrapolate what the use of computers will be in ten years on the basis of their use over the last ten years. Anyone in the computing field can tell a number of stories concerning pessimistic predictions of the need for computers made ten years ago that would seriously embarrass those who made the initial predictions.

3. PAPER-SHUFFLERS AND THE MIDDLE CLASS

Much of the middle class, and lower middle class, is quite complacent about the peril of automation, feeling that it is a problem that affects only the factory worker. This is not at all the case.

A good deal of white collar work consists of paper shuffling accompanied by low-level decision making. This type of decision making can be done more quickly and more accurately by means of modern mathematical theories and digital computers which can store information, process information, and retrieve information.

Automation, in the strict sense of machines replacing humans, will reach far higher up the white collar scale than people would like to think. This will increase both the unemployment problem and the retraining problem.

4. THE AUTOMATERS

We have already pointed out that there are now bigger and better computers, and more of them. Correlated to this is that there are now thousands of people who know how to use computers to implement automation. Furthermore, there are hundreds of people whose jobs depend upon thinking up ways of removing other people from jobs. This is not a pleasant way of thinking of the experts in operations research, systems analysis, management science, and so on, but it describes the situation accurately. Consider all of the small consulting firms who made their living from military contracts. As these cease, they turn their efforts to the civilian economy.

Ten years ago, it was difficult to find someone who had experience with big computers; there were few courses in the colleges and universities. Today, we not only have the modern engineer and business administrator to contend with, but also the Ph.D. in mathematics or physics looking around for a way to be useful to industry.

All of these people are geared to automation. Add to this the fact that it is fashionable to automate; that an organization will be considered old-fashioned if it

does not, and we have all the ingredients for an explosion of automation.

5. IMPROVEMENTS IN TECHNOLOGY

So far we have been speaking only in terms of the effects of the digital computer. My feeling is that the situation would be as serious without the computer. Consider some of the effects of routine improvement in technology, from the well-publicized featherbedding of the railroad fireman and the farmer, to the not so well-publicized featherbedding in a hundred industries and occupations. Consider, for example, what miniaturization will do, what printed electronic circuits will do; consider the light bulbs that never burn out; the razor blades that last ten times as long; the tennis balls good for thirty sets; the nylon stocking good for years; and so on and so on. American industry in various ways has been able to control some of this for some time. It cannot keep on, if only because other nations with emerging industries, or competitive industries, will not allow it.

6. IMPROVEMENTS IN TECHNIQUES

Many of today's jobs are relics of the war or the defense industry after the war. There was little thought of cost or efficiency. The situation has now changed drastically. It follows that without any new scientific input, without computers or new processes, standard efficiency methods would prune a sizable proportion of jobs.

7. CONCLUSION

Adding all of the aforementioned effects together, we have not only an acceleration of automation, but an acceleration of acceleration. I feel that we must conclude that many of the industries that have heretofore

provided large numbers of jobs will no longer serve this important role.

This will mean training and retraining for other types of employment and occupations, particularly those involving personal services of one human being for another.

I have every confidence that our society can effect this transition, provided that we devote time and thought to it. I do not believe that we can let the process take care of itself.